

Common in the reed-beds of Ruo and Liadzi. Difficult to shoot, as it keeps low down in the reeds and bushes. Very noisy. Usually seen in parties of five or six.

20. *MUSCICAPA CÆRULESCENS* (Hartl.) ; Shelley, *Ibis*, 1897, p. 542.

a. Ad. Ruo River, November 1898.

21. *BIAS MUSICUS* (Vieill.) ; Sharpe, *Cat. B. Brit. Mus.* iv. p. 142 (1879).

a. ♀. Ruo River, November 17, 1898.

One female obtained and one other seen.

22. *SMITHORNIS CAPENSIS* (Smith) ; Shelley, *Ibis*, 1894, p. 14.

One only obtained, two others seen, in thick bush.

23. *TERPSIPHONE PERSPICILLATA* (Swains.) ; Shelley, *Ibis*, 1896, p. 234.

Not uncommon ; I found one nest, in February.

24. *HIRUNDO SMITHI* Leach ; Sharpe, *Cat. B. Brit. Mus.* x. p. 150 (1885).

a. Ad. Chiromo, November 1898.

Breeding on almost every house in Chiromo, often inside the rooms. It builds a nest like the Common Martin, but of course much smaller. It is very tame.

25. *HIRUNDO PUELLA* Temm. ; Shelley, *Ibis*, 1894, p. 469.

a. Ad. Ruo River, August 1898.

Fairly common.

26. *PSALIDOPROCNE HOLOMELÆNA* (Sund.) ; Sharpe, *Cat. B. Brit. Mus.* x. p. 292 (1885).

A few were seen in shady parts of the bush, but seldom in the open during sunshine.

27. *PSALIDOPROCNE PERCIVALI* Grant, *Bull. B. O. C.* viii. p. lv (1899).

Psalidoprocne, sp. inc., Percival, *P. Z. S.* 1899, p. 715.

a. Ad. Ruo, August 1898. (Type of the species.)

This small but interesting Swallow was obtained at the

end of August 1898 on the river Ruo. It was in considerable numbers on this one occasion only, and during the nine months that I stayed in the district I never saw it again. It was flying high in the bright sunshine, unlike the other Saw-winged Swallows, which are seldom seen before dusk, when they fly low and usually among trees.

My specimen differs from the type of *P. antinorii*, in the British Museum, in having the gloss on the back greenish black instead of purple.

28. *DENDROPICUS CARDINALIS* (Gmel.); Hargitt, Cat. B. Brit. Mus. xviii. p. 295 (1890).

Rare. This was the only Woodpecker seen.

29. *INDICATOR MAJOR* Steph.; Shelley, Ibis, 1897, p. 545.

Not uncommon on the Liadzi. The natives have a strong objection to this bird being killed, for it shews them where the bees' nests are. I may mention here, that the native-collected wild honey in British Central Africa is nearly always uneatable. I was unable to find out the reason of the objectionable flavour. Honey obtained in the low country of the Transvaal and Swaziland is splendid stuff, very dark and rich in flavour.

30. *MELANOBUCCO TORQUATUS* (Dumont); Shelley, Ibis, 1897, p. 546.

A few were seen. I found a nest in a hollow tree.

31. *SCHIZORHIS CONCOLOR* (Smith); Shelley, Ibis, 1894, p. 7.

Rare, very few seen.

32. *CENTROPUS SENEGALENSIS* (Linn.); Shelley, Cat. B. Brit. Mus. xix. p. 361 (1891).

Extremely common on all the wooded banks of the rivers, particularly on the Liadzi.

33. *COCCYSTES CAFER* (Licht.); Shelley, Ibis, 1897, p. 545.
a. Ad. Ruo River, 1899.

These birds are very noisy. I obtained one out of a pair early in 1899.

34. COCCYSTES JACOBINUS (Bodd.); Shelley, Cat. B. Brit. Mus. xix. p. 217 (1891).

a. Ad. Ruo River, 1899.

Not uncommon, but difficult to shoot. Several of these birds were seen on the Elephant-marsh, helping *Chalcites cupreus* to clear the bushes of insects during the flood.

35. COCCYSTES GLANDARIUS (Linn.); Shelley, Cat. B. Brit. Mus. xix. p. 212 (1891).

I saw several of these birds, but only managed to bag one—a very fine male.

36. CHRYSOCOCCYX SMARAGDINEUS (Sw.); Shelley, Cat. B. Brit. Mus. xix. p. 280 (1891).

This beautiful bird is not uncommon in the more open bush near the Ruo. The male is very easily shot, for he will, during the early part of the breeding-season, take his post on a tall tree and utter his loud whistle, which can be heard for a great distance, remaining in the same place for hours together. These birds often haunt the same tree day after day. They are extremely pugnacious, and are frequently seen chasing one another high in the air. I obtained six males, but only one female.

37. CHRYSOCOCCYX KLAASI (Steph.); Shelley, Ibis, 1894, p. 7.

This species was much rarer than either the Emerald or the Golden Cuckoo, but was often to be heard calling. It was very seldom seen, as it keeps to low thick cover.

38. CHRYSOCOCCYX CUPREUS (Bodd.); Shelley, Ibis, 1894, p. 7.

This species arrives much sooner than the other Cuckoos. It is very noisy and not at all easily shot. At the end of February, when the floods were very bad at Chiromo, I was out in a canoe looking for specimens. In one place, where a few bushes stuck out above the water, I saw fully twenty individuals of this species, as well as many other insect-eating birds. On reaching the bushes I found out the reason; they were simply covered with insects driven up into

them for safety during the flood. In many of the bushes there were some small snakes and lizards. Most of these reptiles had been taken off by the various birds of prey that were at hand. I shot two of the Cuckoos, but found them useless, as they were in very poor plumage.

39. *CEUTHMOCHARES AUSTRALIS* Sharpe; Shelley, *Ibis*, 1897, p. 545.

I saw several of these birds in the very thick bush, and obtained two or three specimens.

40. *TACHORNIS PARVUS* (Licht.); Hartert, *Cat. B. Brit. Mus.* xvi. p. 463 (1892).

Very common. They roost in the leaves of the borassus palm.

41. *MICROPUS CAFFER* (Licht.); Hartert, *Cat. B. Brit. Mus.* xvi. p. 450 (1892).

Very few seen.

42. *CAPRIMULGUS FOSSII* Hartl.; Shelley, *Ibis*, 1897, p. 543.

a. ♀ ad. Ruo River, August 1898.

This small Nightjar was not widely spread over the district, as I only saw it or heard it at one place, and there I could put up six or eight in a hundred yards when walking through the rough grass and stones. I looked carefully for eggs, but never could find any, although the bird seemed to be in breeding condition.

43. *COSMETORNIS VEXILLARIUS* (Gould); Shelley, *Ibis*, 1894, p. 4.

Numerous among the foot hills of British Central Africa, usually on rocky ground. Males are often found in small flocks of five or six, females always singly. The male bird is easily recognised when flying, even without the long feathers, by the white bar across the wing.

44. *MELITTOPHAGUS ALBIFRONS* (Cab. & Heine); Shelley, *Ibis*, 1894, p. 5.

Common over the whole district. It breeds in colonies along with *Merops natalensis*, but later; while it does not

vanish as does the latter bird. It is usually seen in small parties of five or six.

45. *MELITTOPHAGUS MERIDIONALIS* Sharpe; Shelley, Ibis, 1897, p. 544.

Common, usually seen in pairs.

46. *MEROPS NATALENSIS* Reichenb.; Shelley, Ibis, 1894, p. 4.

Merops nubicoides Percival, P. Z. S. 1899, p. 715.

a. Ad. Ruo River, August 1898.

During the months of October and November these birds were numerous on the Ruo and Shiré Rivers, breeding in colonies in the steep banks in company with *M. bullockoides*, which they outnumber by ten to one. Early in December they seemed to vanish almost entirely, and from then till March I did not see more than two or three.

To see the face of a bank covered with these lovely birds, fluttering and clinging to the mouths of their nesting-holes, is a wonderful sight.

On the Ruo, native children snare many of them by setting a noose in the entrance to the nest. In one place I am sure that I saw fifty snares set, and in many of them a bird hanging, dead or dying. The nests are made of the fibres of an aloe. I asked one of the children what they did with the birds: "Eat them, of course," was his answer.

47. *DICROCERCUS HIRUNDINACEUS* (Vieill.); Shelley, Ibis, 1896, p. 230.

Not common, and only once or twice seen in parties of six or eight. It keeps to the trees more than the other species of Bee-eaters.

48. *IRRISOR VIRIDIS* Shelley, Ibis, 1893, p. 8.

Not common, very noisy, and difficult to approach.

49. *RHINOPOMASTUS CYANOMELAS* (Vieill.); Shelley, Ibis, 1897, p. 544.

A few were seen on the Liadzi River, usually in pairs, hunting around dead trees. Very tame.

50. *BUCORAX CAFFER* Bocage; Grant, Cat. B. Brit. Mus. xvii. p. 251 (1892).

Not uncommon in small flocks of five or six, where there is open bush country, particularly near rivers. It is very noisy before rain, calling all night and uttering its peculiar double booming cry.

In Natal and Swaziland *Bucorax cafer* is called the "Rain-bird."

The bare skin of the head and neck is very noticeable when the birds are seen even at a distance of one hundred yards or more. I did not obtain a single specimen, as they were so wild and wary.

51. *LOPHOCEROS MELANOLEUCUS* (Licht.); Shelley, Ibis, 1897, p. 544.

Not uncommon, and usually seen in small flocks. Very noisy. I read in my note-book, August 15th, 1898:—"Crowned Hornbills . . . are very numerous just now, in flocks of six or eight; they are quite fearless, and allow me to walk up to the tree on which they are sitting before moving."

52. *LOPHOCEROS EPIRHINUS* (Sundev.); Grant, Cat. B. Brit. Mus. xvii. p. 408 (1892).

Very few seen.

53. *CORYTHORNIS CYANOSTIGMA* (Rüpp.); Shelley, Ibis, 1897, p. 544.

Very common on all the streams or rivers of the Chiromo district.

54. *ALCEDO SEMITORQUATUS* Swains.; Shelley, Ibis, 1894, p. 467.

Not common on the Ruo or the Shiré.

55. *CERYLE RUDIS* (Linn.); Shelley, Ibis, 1897, p. 544.

Extremely common on the Zambesi and the Shiré, particularly at Fort Herald, on the Shiré, where I often saw parties of seven or eight of these birds together. Commonest in July and August.

56. *CERYLE MAXIMA* (Pall.) ; Shelley, Ibis, 1897, p. 544.

Rare. A very few seen.

57. *HALCYON CHELICUTENSIS* (Stanl.) ; Shelley, Ibis, 1897, p. 545.

a. Ad. Shiré River, February 1899.

During July and August these birds were common and very noisy, calling continually ; but later they were scarce.

58. *HALCYON PALLIDIVENTRIS* Cab. ; Percival, P. Z. S. 1899, p. 715.

a. ♂. M'lolo, Chiromo, December 4, 1898.

59. *SCOPS CAPENSIS* Smith ; Sharpe, Cat. B. Brit. Mus. ii. p. 52, pl. iii. fig. 1 (1875).

I know this bird's call well, from hearing it so often in the Transvaal and in Swaziland, where I have shot specimens. In British Central Africa it was often to be heard at dusk, but it is almost impossible to locate the noise, and even if one does so it is by no means easy to see a little Owl in the dusk, for, even during the day, the bird is easily mistaken for the stump of a branch.

60. *GLAUCIDIUM PERLATUM* (Vieill.) ; Shelley, Ibis, 1897, p. 549.

I saw only one specimen of this Owl, in August, among the borassus palms, and it was with great difficulty that I obtained it, for it dropped dead on one of the large leaves of a palm and was not easily dislodged.

61. *ASIO CAPENSIS* (Smith) ; Shelley, Ibis, 1894, p. 465.

On the voyage down the Shiré I saw an Owl, which was, I think, *Asio capensis* : it was flying quietly over the tops of the reeds during the afternoon—just as one sees the bird on the uplands of Natal.

62. *SYRNIUM WOODFORDI* (Smith) ; Shelley, Ibis, 1897, p. 549.

a. ♀ ad. Ruo River, November 26, 1898.

An example of this Owl was obtained on the bank of the Ruo early one morning when my boys had called me to go after a flock of Geese. I did not get a shot at them, but

went up the river in my dugout for a mile or so, and saw the Owl fly into some thick cover on the bank of the river, so went ashore after it. I never saw another in the district.

63. *CIRCUS MACRURUS* (Gm.); Sharpe, Cat. B. Brit. Mus. i. p. 67 (1874).⁷

a. ♀ ad. Ruo River, November 23, 1898.

A pair of these Owls were for some days about my camp on the Ruo, near the Zoa Falls. They were very fond of washing, and every day came to the same sandbank in the river to have their bath, sitting in the water for an hour or more.

64. *POLYBOROIDES TYPICUS* Smith; Shelley, Ibis, 1896, p. 229.

These birds were not uncommon, haunting the river-banks and palm-groves. They worked the palm-groves very carefully, flying from tree to tree, and examining all the leaves, more particularly those that were dead. They sometimes flew to a frond and hung down, alighting at the point, and half climbing, half flying up the frond, looking, I suppose, for small reptiles and shells. They were not easy to shoot, being very wary.

65. *ASTUR POLYZONOIDES* (Smith); Shelley, Ibis, 1897, p. 551.

a. Ad. Chiromo, Ruo River, July 30, 1898.

This pretty little Hawk was not uncommon around Chiromo in July, August, and the early part of September. After that time I did not see a single specimen. It is extremely tame and very easy to shoot, feeding mostly on insects and small birds. It is to be found in almost every palm-grove, and if disturbed only flies to the next tree, allowing one to walk right underneath before moving.

66. *ACCIPITER MINULLUS* (Daud.); Shelley, Ibis, 1896, p. 177.

A few of these pretty little Hawks are to be seen on the banks of the Ruo, where the thick bush comes down to the water. They seldom venture far thence, and are very

difficult to shoot. I saw one have a long hunt after a Warbler, which was in some cover, too thick for the Hawk to get through. I saw another kill a Weaver-bird.

67. *ASTURINULA MONOGRAMMICA* Temm. ; Shelley, *Ibis*, 1896, p. 229.

I obtained a very fine female of this Hawk on August 12: it was sitting gorged with termites, and allowed me to walk right up to it. This was just after a shower of rain, and the termites were out in thousands. It is a bird of the thick bush and is seldom seen out of it. I observed some four or five at different times, but always in the thickest cover. When flying away the white rump shews very distinctly.

68. *MACHÆRHAMPHUS ANDERSSONI* (Gurney) ; Sharpe, *Cat. B. Brit. Mus.* i. p. 343 (1874).

This bird is nocturnal and feeds on bats.

My specimen was obtained one evening in the early part of August, 1898, while I was waiting for Ducks. In flight the bird much resembles a Falcon ; in fact, until it came to hand, I thought that it was one. Its stomach was quite empty, and the bird itself in very poor condition. It was a young male in changing plumage.

One other example was seen near the Shiré River, some twenty-five miles from where I obtained my specimen. I spent almost the whole of one night watching for it, then told my gun-boy to stay, and promised him a reward if he got it; he saw it on the following evening, but did not get a shot. Later he brought me a female *Polyboroides typicus*, which he said was the right bird, and was anxious to have the reward.

I asked my boys the name of the bird and they all said it was Chic'a'babo ; but that name very likely covers several other Hawks as well.

69. *HALIAËTUS VOCIFER* (Daud.) ; Shelley, *Ibis*, 1897, p. 549.

By no means rare along the Zambesi and the Shiré, breeding both on rocks and in trees.

The name *vocifer* is very appropriate, for during the wet season the loud call of this Eagle may constantly be heard.

70. *LOPHOAËTUS OCCIPITALIS* (Daud.); Shelley, *Ibis*, 1897, p. 550.

a. Ad. Ruo River.

This is the commonest Eagle in the district. It is a sulky sort of bird, and will sit for hours on a dead branch with its feathers puffed out and eyes half-closed, looking more like a big Owl than anything else. It feeds chiefly on snakes and reptiles. Now and then it wakes up and soars to a tremendous height, where it sails round and round in circles, making a most peculiar noise, more like the drumming of a Snipe than anything else; and, as with the Snipe, the sound is only made during a downward sweep.

71. *ERYTHROPUS DICKINSONI* (Scl.); Shelley, *Ibis*, 1897, p. 547.

a, b. Ad. Shiré River, August 1898, and February 9, 1899.

I obtained a female of this Falcon in August 1898, and a male on February 9, 1899, at almost the same spot, or one not more than two hundred yards distant, while on several other occasions I saw an individual about there. The birds are not wild, but scarce. They are usually seen amongst the borassus palms near the river.

72. *DENDROCYCNA VIDUATA* (Linn.); Shelley, *Ibis*, 1896, p. 240.

Very numerous.

73. *SARCIDIORNIS MELANONOTA* (Temm.); Shelley, *Ibis*, 1896, p. 240.

Only one specimen obtained.

74. *PLECTROPTERUS GAMBENSIS* (Linn.); Shelley, *Ibis*, 1894, p. 477.

Numerous in the early part of the year, but difficult to shoot.

75. HAGEDASHIA HAGEDASH (Lath.) ; Shelley, Ibis, 1897, p. 551.

I often saw a small party of these Ibises on the Ruo, but never managed to obtain any.

76. ARDEA PURPUREA Linn. ; Shelley, Ibis, 1897, p. 551.

This is the Common Heron of the Shiré. Individuals roost together during the day in the long reeds.

77. ARDEA GOLIATH Cretzschm. ; Shelley, Ibis, 1894, p. 27.

Not uncommon on the Zambesi, but rare on the Shiré. It likes to get out on open banks quite away from cover, and is very difficult to approach even within rifle-shot. My only specimen was obtained with a rifle.

78. NYCTICORAX NYCTICORAX (Linn.) ; Shelley, Ibis, 1896, p. 239.

Usually seen in small parties, but at a small island in the Shiré I put up fifty or more from one patch of reeds. They very soon settle again if disturbed during the day.

79. SCOPUS UMBRETTA (Gm.) ; Shelley, Ibis, 1894, p. 477.
Common.

80. HERODIAS INTERMEDIA Shelley, Ibis, 1896, p. 239.

Very common both on the Zambesi and the Shiré.

81. HERODIAS RALLOIDES (Scop.) ; Shelley, Ibis, 1896, p. 239.

a. Ad. Ruo River.

A few seen, but the bird is not common.

82. BUTORIDES ATRICAPILLA (Afzel.) ; Shelley, Ibis, 1894, p. 476.

a. ♀. Ruo River, February 10, 1899.

b. Ad. Ruo River, November 17, 1898.

Native name "Voom-Voo."

Fairly common on the Shiré and very noisy at night. It is a solitary bird, and is usually found in thick reeds. The stomachs of those I examined contained locusts and beetles.

83. ARDETTA PUSILLA Shelley, Ibis, 1894, p. 476.

Ardetta podiceps (Bp.); Sharpe, Cat. B. Brit. Mus. xxvi. p. 225 (1898).

Common in the marshes near the river. The males seemed to be much more common than the females. They kept to thick cover, as a rule, and perched on the reeds.

84. ERYTHROCYNUS RUFIVENTRIS (Sundev.); Sharpe, Cat. B. Brit. Mus. xxvi. p. 200 (1898).

I obtained only one specimen of this pretty little Heron, but saw one or two others; they are very wild. They settle high up on reeds, and so are able to see anyone approaching. Iris yellow; bare skin round eye greenish yellow; bill—upper mandible black, lower yellow with black tip; legs yellow.

85. LEPTOPTILUS CRUMENIFER (Cuv.); Shelley, Ibis, 1894, p. 477.

Numerous in the Elephant-marsh.

86. PHYLLOPEZUS AFRICANUS (Gm.).

Parra africana Shelley, Ibis, 1894, p. 25.

These graceful birds were to be seen wherever there was any floating weed or marshy bank. They were particularly common on the Portuguese side of Ruo, opposite Chiromo, and in a narrow stream which joined the Shiré above Chiromo, after coming through the Elephant-marsh. They were always in pairs or parties; it was a most unusual thing to see a solitary bird. They looked very pretty running about over the floating stuff or flying round. If two parties meet they will at once start to fight, following each other on the wing until one party or the other is driven off. If wounded they dive well, often taking hold of weeds under water and staying there.

87. HIMANTOPUS CANDIDUS Bonn.; Shelley, Ibis, 1894, p. 475.

Rare; I saw only two pairs during all my trips, and those escaped me. I watched them for some time feeding. They are good swimmers; one which I saw took quite a long swim across a channel.

88. *ÆGIALITIS PECUARIA* (Temm.) ; Shelley, Ibis, 1894, p. 474.

Common on almost every sand-bank along the Shiré and the Ruo, often in flocks of twenty or more.

89. *GLOTTIS NEBULARIUS*.

Totanus nebularius (Gunner) ; Shelley, Ibis, 1896, p. 238.

In small parties of four or five ; very noisy in the evenings.

90. *TOTANUS GLAREOLA* (Linn.) ; Shelley, Ibis, 1897, p. 553.

Usually found on marshy ground near the river, but occasionally along with *Æ. pecuaria* on the sand-banks. Seems to be rather a solitary bird.

91. *TEREKIA CINEREA* (Güldenst.) ; Sharpe, Cat. B. Brit. Mus. xxiv. p. 474 (1896).

I saw a small flock of this Sandpiper at Chinde, at the mouth of the Zambesi.

92. *LIMNOCORAX NIGER* (Licht.) ; Shelley, Ibis, 1894, p. 473.

a. Ad. Elephant-marsh, Ruo River, February 1899.

b. ♀. Ruo River, November 17, 1898.

Common, but difficult to shoot. A few were brought to me alive, having been snared in the marshes.

93. *PORPHYRIOLA ALLENI* (Thomps.) ; Sharpe, Cat. B. Brit. Mus. xxiv. p. 187 (1894).

a. ♂. Elephant-marsh, Ruo River, March 1899.

b, c. ♂ ♀. Ruo River, February 10, 1899.

Common in the Elephant-marsh, where I collected a very nice series during the floods, the birds being driven out of the thick cover. On March I found a nest in reeds with one egg, but I obtained another egg from the body of a female which I shot.

94. *PODICIPES CAPENSIS* Licht. ; Shelley, Ibis, 1896, p. 241.

a. Ad. Ruo River, February 1899.

Only one specimen obtained.

95. *VINAGO DELALANDII* (Bp.); Shelley, *Ibis*, 1895, p. 547.

Rare. Two or three birds were brought me from the hills to the west of the Shiré.

96. *CHALCOPELIA AFRA* (Linn.); Shelley, *Ibis*, 1897, p. 548.

Common. Feeds round the outside of the bush. Very quick on the wing.

97. *TYMPANISTRIA TYMPANISTRIA* (Temm.); Shelley, *Ibis*, 1897, p. 548.

Rare, or at least very rarely seen, keeping to the thickest bush.

98. *FRANCOLINUS KIRKI* Hartl.; Grant, *Cat. B. Brit. Mus.* xxii. p. 149 (1893).

Not uncommon—two or three nests found. The eggs of this bird are remarkably thick-shelled.

99. *NUMIDA CORONATA* Gray; Grant, *Cat. B. Brit. Mus.* xxii. p. 376 (1893).

Common on the banks of all the rivers. These birds always roost in the same trees, so that once the place is found one may be sure of getting them by waiting there at night. On one occasion I was called out early in the morning by my boys to shoot "Kanga," and was taken about a mile to a dusty patch near the path, and there I saw quite fifty birds sunning themselves. I managed to creep over a bank not twenty yards from them and secure all that I required.

During the heat of the day these Guinea-fowls may often be seen near the water, but are then very difficult to approach.

100. *TURNIX NANA* (Sundev.); Shelley, *Ibis*, 1897, p. 552.
Common in old native gardens.

101. *RHYNCHOPS FLAVIROSTRIS* Vieill.; Shelley, *Ibis*, 1893, p. 29.

These strange birds are fairly common on the upper waters of the Shiré, particularly between Maquera's and Katunga's. In my field-notes (Sept. 1898, Maquera's), I find—"The

Scissor-bills are very peculiar in their habits, as well as in appearance. They are common here, sitting during the day on the sand-banks. At night they skim about over the shallows, apparently with the long lower mandible in the water. They look very strange with the wings quite upright, reminding one of a Nightjar." They usually go in parties of four or five, and look very large in the dusk.

XXXVII.—*On the Syrinx and other Points in the Structure of Hierococcyx and some allied Genera of Cuckoos.* By FRANK E. BEDDARD, F.R.S. &c.

THE most recent estimate of the genera and species of Cuckoos known to science is contained in the lately issued 'Hand-list of Birds'*. In this list Dr. Sharpe enumerates no less than forty-six genera. Of these forty-six not more than twenty have been investigated anatomically, and most of them in but a fragmentary way. One cannot, therefore, help agreeing with Dr. Shufeldt in his reflection † that an elaborately detailed classification, such as that adopted by Dr. Sharpe from the previously published volume of the British Museum Catalogue dealing with the Cuculidæ, must necessarily contain much "guesswork." In spite of this scheme of classification, which, by reason of its authoritative issue, suggests finality, it is not possible at present to do more than indicate the very broadest lines along which subdivision of the Cuckoos should be proceeded with. It is desirable, therefore, to attempt an improvement upon this state of affairs, and to record as many new facts as possible about the anatomy of this comparatively little-known group of birds. From this may emerge a mode of arrangement of the Cuculidæ which shall be more satisfactory than that to which attention has just been drawn. With a view to being of assistance in the matter, I have

* 'A Hand-list of the Genera and Species of Birds,' vol. ii. pp. 155-175 (1900).

† "The Osteology of the Cuckoos (*Coccyges*)," Proc. Acad. Amer. Phil. Soc. xl. 1901, no. 165.

in the present communication to lay a few new facts before the readers of this Journal. These chiefly concern the genera *Hierococcyx*, *Rhamphococcyx*, and *Coccytes*, with regard to none of which have we at present any adequate knowledge of such anatomical features as might serve to indicate their relationship to allied genera. Some seventeen years ago I made an attempt* to arrange the Cuckoos according to the modifications in the feather-tracts, the structure of the syrinx, and the Garrodian leg-muscle formula. A subsequent investigation of the genera *Scythrops*† and *Carpococcyx*‡ served to support the arrangement which I originally proposed; and the new facts which I have now to record point in precisely the same direction.

Apart from subsidiary differences, the Cuckoos in their pterylosis present us with two chief modifications. In one series of birds the ventral feather-tracts are single on each side of the body. In the other series the same tracts are divided, and thus a more complicated pterylosis is arrived at. This more complicated pterylosis characterizes *Centropus*, *Carpococcyx*, *Scythrops*, *Eudynamis*, *Phœnicophaës* and *Crotophaga*; the simpler ventral pterylosis, in which the tract is not divided again after its first separation into two branches on the neck, is to be found in *Cuculus*, *Piaya*, and other forms. In *Hierococcyx varius* the pterylosis is entirely upon the Cuculine plan. Each ventral tract is undivided. On the abdomen the rows of feathers constituting each tract are less in number than in the pectoral region. There are three distinct rows of feathers, each at some little distance from its neighbours. This arrangement into three rows is precisely what occurs in the genus *Cuculus*. In both the genera referred to these three rows approach each other some little way before the tract ends at the cloaca, and two

* "On the Structural Characters and Classification of the Cuckoos," P. Z. S. 1885, p. 168.

† "On the Anatomy of an Australian Cuckoo, *Scythrops novæ-hollandiæ*," P. Z. S. 1898, p. 44.

‡ "On the Anatomy of the Radiated Fruit-Cuckoo, *Carpococcyx radiatus*," Ibis, 1901, p. 200.

of them entirely disappear. Thus in *Hierococcyx*, in *Cuculus*, and in the allied genus *Cacomantis* the ventral tract of either side ends in a single row of feathers through the suppression of the two rows which are found in addition higher up in the tract.

The second feature which I believe to be of importance for purposes of classification is that afforded by the muscles of the thigh. Garrod had already on these grounds divided a Cuculine from a Centropine series*. And in my memoir upon the classification of this order or family I adopted the facts given by Garrod (adding somewhat to them) in my definitions of the three groups into which I proposed—and indeed still propose—to divide the existing Cuckoos. In *Centropus*, &c., the muscle-formula of the leg is the full formula A B X Y with the ambiens. In *Cuculus* and its allies the muscle-formula is reduced by the loss of B, the accessory femoro-caudal muscle. It will be observed that the loss of this muscle is coincident with the loss of the outer band of the ventral feather-tracts. One cannot help thinking that the apparent loss is a real loss in both cases, a reduction from a more complicated state of affairs. In any case there is no Cuckoo known with the formula A X Y which possesses the outer band of the ventral feather-tract; and, conversely, no Cuckoo known which possesses that outer band that has not also got the full muscular formula A B X Y.

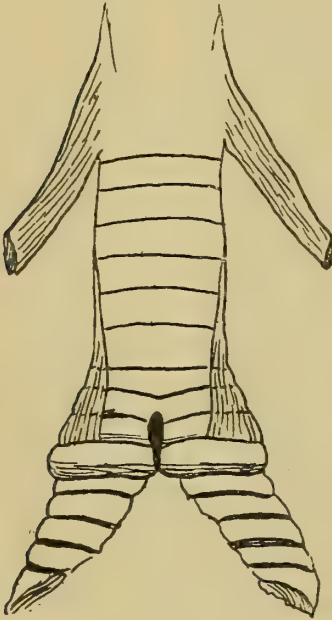
Hierococcyx proves to be no exception to this rule, at present universal. The muscle-formula of the thigh is A X Y with, of course, the ambiens muscle also.

The third structural feature upon which I based my attempted classification of the Cuculidæ concerns the form of the syrinx. This organ is developed along two lines in this group of birds. In many forms the syrinx is apparently of the most typical avian form, in which the intrinsic muscles of the syrinx are attached to a bronchial semi-ring close to the point at which the trachea divides into the two bronchi. This form of syrinx is generally known as the tracheo-bronchial, and is—as is well known—the most usual form

* Coll. Scientific Papers, ed. by W. A. Forbes, London, 1881, p. 220.

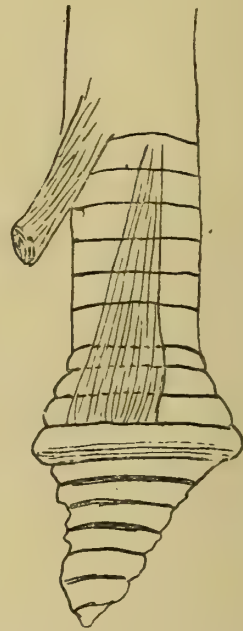
of the organ among birds. There is not, however, a complete coincidence between the existence of a tracheo-bronchial syrinx and the other two variable features in the anatomy of the Cuckoos. It is true that all Cuckoos with the reduced muscle-formula and a simplified ventral feather-tract have the tracheo-bronchial syrinx; but it is not true that all Cuckoos with the full muscle-formula and the more complicated ventral pterylosis are different also in the form of their syrinx. In fact, in *Eudynamis* and its allies the

Fig. 16.



End of trachea and bronchi
of *Hierococcyx varius* ;
ventral aspect.

Fig. 17.



End of trachea and
bronchus of the same ;
lateral aspect.

syrinx is of the tracheo-bronchial type, while the formula of the thigh is, as already stated, A B X Y with naturally divided ventral pterylosis. On the other hand, no Cuckoo is known which possesses the derived form of syrinx known as "bronchial" (in which the attachment of the syringeal muscles is much lower down the bronchi) that does not also possess the thigh-muscle formula A B X Y and has not the divided ventral tracts. It would be assumed, therefore, that *Hierococcyx*, having the reduced muscle-formula and

simplified ventral feather-tracts, would also possess a syrinx arranged on the tracheo-bronchial plan. This, again, is exactly the form of syrinx which that genus of Cuckoos does possess, and the following is a more detailed description of it. The syrinx of *Hierococcyx varius* is displayed in the annexed illustrations (figs. 16, 17, p. 602).

The last tracheal ring and the first three bronchial semi-rings are very plainly to be distinguished from the preceding tracheal rings and the succeeding bronchial semi-rings. They are obvious and different from them on account of their red colour. As will be gathered from this colour, the rings and semi-rings in question are ossified. But so also, though differing in colour, are the tracheal rings which precede. On the other hand, the bronchial semi-rings which follow after the first three are soft and cartilaginous. The pessulus of this syrinx is quite well developed. It marks by its origin on both sides of the windpipe the last tracheal ring. The three strong semi-rings which follow are thus plainly bronchial in spite of their resemblance to split tracheal rings, and their great difference from the soft cartilaginous bronchial rings which immediately ensue. Or, to be probably more accurate, they are really rings belonging to the tracheal section of the windpipe which have taken on the characters of bronchial semi-rings. This matter, however, will be referred to again in considering other forms of syrinx in this family of birds. *Hierococcyx* possesses the usual pair of intrinsic syringeal muscles, which are thin and not easy to see. These muscles fan out at their insertion, which is on the third bronchial semi-ring, of the three that are ossified, of course.

I shall now proceed to compare the windpipe of *Hierococcyx* with that of the closely related genus *Cuculus*. I gave in my earliest paper upon Cuckoo anatomy a brief account of the syrinx of *Cuculus canorus*. I may supplement this by a more detailed account of the syrinx of the Eastern *Cuculus micropterus*, a specimen of which, presented to the Zoological Society by Mr. E. W. Harper, of Calcutta, died in the Society's Gardens last year. The syrinx of this bird presents an interesting and significant departure in structure from